Intel® Itanium™ Architecture: High Performance Computing (HPC) Grid Fuels Genetic Research

The successful mapping of the human genome and other biotechnology breakthroughs have pushed genetics into the spotlight. But existing genetic databases already strain the processing limits of the world's most powerful computers. The vast quantities of new genetic data now becoming available only widen the gap between the ability of genetic researchers to capture this exciting new information and their power to analyze and reference it.

High Performance Computing (HPC) systems built using the Intel® Itanium™ architecture directly address this challenge. A consortium of Norwegian universities has developed an HPC grid connecting their total computer resources into a geographically distributed but virtually consolidated system. The grid is delivering expanded processing capabilities by incorporating scalable, flexible clusters of systems based in part on the Intel Itanium processor. As a commercial user of the grid, Sencel Bioinformatics* develops software that accelerates a key genetic research procedure. Sencel believes that the grid's Intel Itanium processors will allow Sencel software to process this procedure faster than any other processor, thereby accelerating possible biotechnology breakthroughs.

INTEL®-BASED SOLUTION

- Clustered HP* i2000* Intel® Itanium™-based (800 MHz) systems
- Linux*
- HP-UX*
- Microsoft* Windows XP* (planned)
- Open Cluster Group OSCAR* Linux cluster management tool
- Score* clustering software
- Message Passing Interface (MPI)

Seeking More Affordable Power

Scientists at Norway's leading universities are conducting large-scale research projects in genetics and biotechnology. To provide the computing power for these research projects while keeping costs tightly contained, researchers created the NOTUR* (Norwegian Supercomputing) grid. Sencel Bioinformatics, one of the grid's users, is developing PARALIGN* software to dramatically accelerate common but critical algorithms used for rigorous genome sequence database searching. The prohibitive cost of special-purpose hardware previously used for such procedures presented a significant obstacle to the widespread use of the most accurate search algorithms.

"Since we are publicly funded, getting real value for our money is critical. We cannot risk making the wrong choice on an architecture. This made the Itanium processor family very interesting to us."

Arne Laukholm, Director, Center for Information Technology Service, University of Oslo*

Running on Intel

NOTUR designed and built an HPC grid by connecting geographically dispersed systems, including clusters of IBM* and SGI* computers. NOTUR's HPC specialists determined that the superior flexibility, scalability, and performance of Intel Itanium-based systems would be the ideal match for their computing needs. Working closely with Hewlett-Packard* engineers, the consortium added the Intel Itanium-powered clusters to the grid. The advantages of the Intel architecture HPC strategy were immediately clear. The distributed HPC grid could deliver the power to run highly demanding and data-intensive applications.

"Because Intel® Itanium™ processors are widely supported by the HPC community, we believe that the product family will be very successful. We have invested in HPC clustering, and the Itanium processor family fits in well with that clustering model."

Arne Laukholm, Director, Center for Information Technology Service, University of Oslo*

Flexibility to Grow and Adapt

NOTUR sees great value in the Itanium processor's support for multiple operating systems. Researchers like the clustering capabilities of Linux and the performance of HP-UX. Using the industry-standard Message Passing Interface (MPI), they can consolidate on a single hardware architecture and create a unified environment despite the heterogeneous operating environments. NOTUR also has the flexibility to deploy applications that run on Microsoft Windows XP, and can continue to support existing RISC legacy applications.

"We expect to run 64-bit applications on Windows XP*; the Intel® Itanium™ processor gives us the opportunity to test these applications and their performance."

Lars Oftedal, Assistant Director, Center for Information Technology Services, University of Oslo*

Boosting Performance While Cutting Costs

Today, Intel® technology helps support NOTUR members in their efforts to enter into a new era of HPC that delivers extraordinary performance at a competitive price. Sencel provides a case in point. By taking advantage of the Itanium architecture's many execution units and multimedia technology to execute gene sequence comparison algorithms, Sencel expects to deliver software capable of analyzing gene sequences much faster than previously possible, at an affordable price.

"We expect the 800 MHz Intel® Itanium™ processor to perform in the range of 600 to 800 million symbol comparisons per second with the Smith-Waterman algorithm. Thus, even the first-generation processor in this family will probably be faster for this application than any other processor."

Torbjørn Rognes, Chief Technology Officer, Sencel Bioinformatics AS*

Bottom Line

Intel Itanium-based HPC systems—with outstanding performance, scalability, flexibility, and competitive prices—allow scientists to make advances in such areas as bioinformatics and genetic research that would have been impossible just a few years ago. Eventually, the Norwegian grid will also be used in research across a variety of disciplines, with future systems running second-generation Itanium family processors.

"We are starting with Itanium now to ensure that we have the clustering management software we need before the next generation of Itanium™ processors becomes available. I believe that this next-generation processor will be very important for us—early indications are that it is going to be a very good price-performer."

Arne Laukholm, Director, Center for Information Technology Service, University of Oslo*

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